REMARKS

Claims 2-8, 10-15, and 17-19 are pending in the application.

By the foregoing Amendment, claims 4, 13, and 19 are amended. Claim 9 is canceled without prejudice or disclaimer. The specification is amended to correct miscellaneous informalities, including moving the paragraphs under the heading "Industrial Applicability" to immediately follow the heading "SUMMARY OF THE INVENTION."

Claim 19 is amended to add the limitation that the slurry of the mixing area flows into the chute section under the pressure of the mixer and to clarify that the mixer is single.

The following limitations from claim 9 are also added to claim 19:

i) the fractionating means provides fluid communication between the slurry delivery conduit and at least one of said chute section and said hollow connector section; and

ii) the part of the gypsum slurry in at least one of said chute section and said hollow connector section is delivered through the slurry fractionation means to said slurry delivery conduit by fluid pressure of the gypsum slurry in the chute section or the hollow connector section.

Support for the limitation to the effect that the slurry of the mixing area flows into the chute section under the pressure of the mixer is found in the original specification at page 16, line 29 through page 17, line 10 (corresponding to paragraphs 00061-00062 of the substitute specification) as follows:

> In operation, the starting materials including the powder materials for gypsum board, the mixing water, the foaming agent and so forth are successively fed to the mixer 4 thorough the powder conduit 45, the water supply conduit 46 and the foam feeding conduit 48. The mixer 4 causes the disc 60 to rotate by means of operation of the driving device so that these materials are stirred and

mixed with each other. The gypsum slurry in the mixer 4 moves radially outward on the disc 60 under the action of the centrifugal force, and enters the chute 51 through the outlet end 50b of the connector section 50.

In a usual production process of gypsum boards, the slurry agitators 10, 15, 16 are in operation, and therefore, the valve 70 is kept in its first position (rod retraction position) and the valve body 37a is kept in the fractionating position (FIG. 6). The gypsum slurry flows into the chute 51 through the outlet end 50b of the connector section 50 under the high displacement pressure of the mixer 4.

Further support is found in the original specification at page 18, lines 16-18 (corresponding to paragraph 00067 of the substitute specification):

The slurry displacement pressure of the mixer 4 acts on the internal area 58 of the chute section 5, and the internal pressure in the area 58 is stable in a relatively high pressure.

Claim 4 is amended to correct its dependency. Claim 13 is amended for consistency with the amendments to claim 9.

These changes are believed not to introduce new matter, and entry of the Amendment is respectfully requested.

Based on the above Amendment and the following Remarks, Applicant respectfully requests that the Examiner reconsider all outstanding objections and rejections, and withdraw them.

Rejection under 35 U.S.C. § 112, ¶ 1

In paragraph 2 of the Office Action, claims 2-15 and 17-19 were rejected under section 112, paragraph 1 as failing to comply with the written description requirement on the ground that

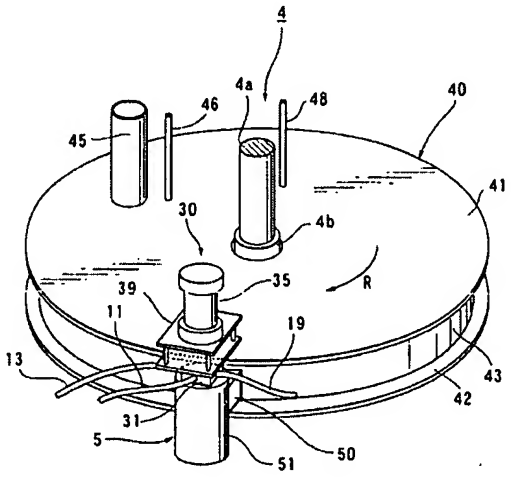
the application as originally filed does not teach "fractionating means provided on the mixer" and does not describe a "fractionating means." This rejection is respectfully traversed.

The structure described in the original specification that corresponds to the "fractionating means" in accordance with section 112, paragraph 2 is the slurry fractionation port, which is described in the original specification at page 6, lines 12-22 (corresponding to paragraphs 00017-0 0018 of the substitute specification) as follows (with emphasis added):

> *an apparatus for fractionating gypsum slurry from a mixer for gypsum slurry, which is provided on the mixer*, the mixer being arranged so that calcined gypsum and water are mixed in a mixing area inside of a housing for preparation of the gypsum slurry, and that the gypsum slurry continuously flows from a hollow connector section into a chute section to be discharged through a slurry discharge port of the chute section: *comprising*
>
> *a slurry fractionation port* in fluid communication with a slurry delivery conduit, the slurry fractionation port being disposed at said chute section and/or said hollow connector section so as to fractionate the gypsum slurry in said chute section and/or said hollow connector section

The original specification further provides at page 14, line 19- page 15, line 19 (corresponding to paragraphs 00053 and 00056 of the substitute specification) that the apparatus for fractionating slurry 30 comprises a slurry fractionating device 31 and a fluid-actuated cylinder device 35, which are connected to each other; that the hollow connector section 50 is connected to the peripheral outer wall 43 of the mixer 4; that the outlet end 50b of the connector section 50 is connected to a peripheral outer wall 51a of the chute 51, a lower outlet end of the peripheral outer wall 51a of which constitutes the slurry discharge port of the chute section 5; that the slurry fractionating device 31 is installed on the horizontal top wall 51c of the chute 51; and that the fractionating port 33 is disposed opposite a valve body 37a integrally secured to a circular valve body 37a of a

movable cylinder rod 37 of the cylinder device 35. Thus, the fractionating port 33 (which is part of the apparatus 30) is provided on the mixer via the hollow connector section 50 and the chute section 5, as shown in Figure 3, which is reproduced below:



In view of the foregoing, it is respectfully submitted that the application as originally filed teaches both "fractionating means provided on the mixer" and a "fractionating means" in full compliance with the requirements of section 112, and that the rejection should be withdrawn.

Rejection under 35 U.S.C. § 112, ¶ 2

In paragraph 4 of the Office Action, claims 4-6, 13-15 and 18 were rejected under U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. This rejection is believed to be overcome by the amendment of claim 4 to depend from claim 19, and by the foregoing amendments to claim 13 as suggested by the Examiner.

Provisional Objections to the Claims

In paragraph 5 of the Office Action, claim 17 was provisionally objected to as being a substantial duplicate of claim 17. This provisional objection is rendered moot by the cancellation of claim 17.

Introductory Comments Regarding the Invention and the References

The Office Action applies the following prior art references in rejecting the claims:

- US 5,714,032 (Ainsley *et al.*)
- JP 08-112808
- US 6,193,408 (Miura *et al.*)
- WO 93/03899
- US 5,683,635 (Sucech *et al.*)
- US 6,878,321 (Hauber *et al.*)
- US 6,190,476 (Seecharan *et al.*)

Block diagrams of the apparatus of the present invention and the prior art apparatus are shown in Attachment 1.

In the present invention, as reflected in claim 19:

1) The slurry is delivered or fractionated from the mixer by the pressure (displacement or delivery pressure) of the mixer;

2) The slurry is fractionated from the main slurry outside of the mixing area of the mixer; and

3) The slurry is fractionated from the chute or the hollow connector section for discharging the slurry effluent from the mixing area onto the lower paper.

Because the slurry is delivered or fractionated from the mixer by the pressure (displacement or delivery pressure) of the mixer, the present invention does not use the suction pressure of a pump to achieve fractionation.

In the apparatus of both US 5,714,032 (Ainsley *et al.*) and WO 93/03899 (Bold), two kinds of slurry are prepared by two-stage mixing steps with use of two different mixers. This is not fractionation of slurry, but production of two kinds of slurry by two different mixers. Fractionation of the slurry is actually carried out by the suction pressure of the pump ("P") in Ainsley *et al.*'s and Bold's apparatus.

In recent years, the setting or curing of gypsum slurry has been accelerated to speed up production by, e.g., the addition of a setting accelerator. Clogging or jamming of the pump is apt to result, owing to setting or curing of the gypsum slurry. Therefore, a pump (such as disclosed by Ainsley *et al.* and Bold) is not used for feeding and fractionating the gypsum slurry in the conventional production of gypsum boards; but instead, the slurry is fed and fractionated by the pressure (displacement or delivery pressure) of the mixer, which depends on the internal pressure of the mixer for mixing of the powder materials, foam and water, as disclosed in JP 08-112808, US 5,683,635 (Sucech *et al.*), US 6,878,321 (Hauber *et al.*), and US 6,190,476 (Seecharan *et al.*).

The internal pressure in the mixer is considered to be high and stable. Therefore, in the apparatus disclosed in JP 08-12808, US 5,683,635, US 6,878,321 and US 6,190,476, the fractionated slurry is extracted directly from the periphery of the mixing area of the mixer under the pressure in the mixer. However, in the apparatus of JP 08-12808, US 5,683,635, US 6,878,321 and US 6,190,476, the main slurry ("slurry 1" in Attachment 1) and the fractionated slurry ("slurry 2" in Attachment 1) leave the mixing area at different circumferential positions or points of the mixing area. The condition of the fractionated slurry ("slurry 2") differs from that

of the main slurry ("slurry 1"). Therefore, the main slurry ("slurry 1") and the fractionated slurry ("slurry 2") have different mixed conditions, in the apparatus of in JP 08-12808, US 5,683,635, US 6,878,321 and US 6,190,476.

Rejections under 35 U.S.C. § 102

In paragraph 8 of the Office Action, claims 2, 7, 9, 10 and 19 were rejected under 35 U.S.C. 102(b) as being anticipated by Ainsley *et al.* (US 5,714,032). This rejection is believed to be overcome by the foregoing amendments to claim 19.

As explained above, in Ainsley *et al.*'s the apparatus, Fractionation of the slurry is actually carried out by the suction pressure of the pump ("P"). Thus, Ainsley *et al.* does not teach or suggest that (1) the slurry is delivered or fractionated from the mixer by the pressure (displacement or delivery pressure) of the mixer; (2) the slurry is fractionated from the main slurry outside of the mixing area of the mixer; and (3) the slurry is fractionated from the chute or the hollow connector section for discharging the slurry effluent from the mixing area onto the lower paper, as recited in claim 19.

In view of the foregoing, it is respectfully submitted that Ainsley does not anticipate the invention as recited in claim 19 and the claims depending therefrom; and that the rejection should be withdrawn.

Rejections under 35 U.S.C. § 103

In paragraph 9 of the Office Action, claims 4-7, 9-10, 13-14, 17 and 19 are rejected under section 103(a) as being unpatentable over Japan 808 (JP 08-112808) in view of Miura *et al.* (US 6,193,408), Bold (CA 2116132) and Sucech *et al.* (US 5,683,635); in paragraph 10, claims 2-3, 8

and 11-12 under section 103(a) as being unpatentable over Japan 808 (JP 08-112808) in view of Miura *et al.* (US 6,193,408), Bold (CA 2116132) and Sucech *et al.* (US 5,683,635) and further in view of Hauber *et al.* (US 6,878,321); and in paragraph 11, claims 15 and 18 are rejected under section 103(a) as being unpatentable over Japan 808 (JP 08-112808) in view of Miura *et al.* (US 6,193,408), Bold (CA 2116132) and Sucech *et al.* (US 5,683,635) and further in view of Seecharan *et al.* (US 6,190,476). These rejections are believed to be overcome by the foregoing amendments to claim 19.

The Office Action appears to take the position that the gypsum slurry can be fractionated by the suction pressure of a pump. However, a pump cannot be used for fractionation in the production of gypsum boards, as explained below. Hence, in practice, the gypsum slurry is fractionated from the mixing area of the mixer by the internal pressure of the mixer by the internal pressure of the mixer, as disclosed in JP 08-112808, US 5,686,635 (Sucech *et al.*), US 6,878,321 (Hauber *et al.*), and US 6,190,476 (Seecharan *et al.*) without use of a pump.

The inventors of the present invention recognized the stable density of the slurry and stable high pressure of the slurry in a hollow connector section and a chute section. None of the cited references discloses or suggests that such a condition or state can be obtained in the hollow connector and the chute sections. None of the cited references discloses or suggests that the slurry effluent from the mixing area, which exists in the chute or hollow connector section, still has pressure sufficient for fractionation of the slurry (that is, pressure for delivering a part of the slurry through the fractionation port to the slurry delivery conduit). None of the cited references discloses or suggests that a part of the gypsum slurry therein can be delivered through the slurry fractionation port to the slurry delivery conduit by the fluid pressure in the chute or hollow

connector section, in spite of the fact that the fluid pressure therein merely derives from the displacement or delivery pressure of the mixer.

i) *WO 93/03899 (Bold)*

As explained above, in Bold's apparatus, fractionation of the slurry is actually carried out by the suction pressure of the pump.

ii) *JP 08-112808, US 5,683,635 (Sucech et al.), US 6,878,321 (Hauber et al.), and US 6,190,476 (Seecharan et al.)*

As explained above, in the apparatus of JP 08-112808, US 5,683,635 (Sucech *et al.*), US 6,878,321 (Hauber *et al.*), and US 6,190,476 (Seecharan *et al.*), the slurry is fed and fractionated by the pressure (displacement or delivery pressure) of the mixer, which depends on the internal pressure of the mixer for mixing of the powder materials, foam and water; and the fractionated slurry is extracted directly from the periphery of the mixing area of the mixer under the pressure in the mixer. However, the main slurry ("slurry 1" in Attachment 1) and the fractionated slurry ("slurry 2" in Attachment 1) leave the mixing area at different circumferential positions or points of the mixing area, and the main slurry ("slurry 1") and the fractionated slurry ("slurry 2") have different mixed conditions. The main causes of the differences of these slurry outflows are as follows:

The slurry at a circumferentially downstream position (forward in the rotational direction) is subjected to a mixing action for a longer time, compared to the slurry at a circumferentially upstream position (backward in the rotational direction). For example, foam in the slurry is destroyed or defoamed by mixing action, and therefore, slurry subjected to mixing action for a longer time has a smaller quantity of foam. Thus, if the slurry leaves at different circumferential positions or points as shown in the slurry leaves at different circumferential

positions or points as shown in the apparatus of the above four cited references, the slurry outflows (slurry 1 and 2) are different in the quantity of foam and so forth.

In other words, the positional difference of the slurry outlet should be a factor in adjusting the condition of slurry (e.g., the density of slurry, or the content of foam in the slurry) but it is very difficult to determine this factor, much less use it, in controlling the preparation of the slurry.

However, according to the present invention, both of the slurry outflows leave at the same position or point (the chute or hollow connector section), although that point is out of the mixing area of the mixer. As a result, the mixed condition of the fractionated slurry (slurry 2) is the same as that of the main slurry (slurry 1).

It is unpredictable that the slurry effluent from the mixing area, which exists in the chute or hollow connector section, still has pressure sufficient for fractionation of the slurry (that is, pressure for delivering a part of the slurry through the fractionation port to the slurry delivery conduit). This is not disclosed nor suggested in the cited references.

iii) *US 6,193,408 (Miura et al.)*

In the Office Action, US 6,193,408 (Miura *et al.*) was cited as suggesting "connecting a 'chute section' 41 to a mixer 10 for mixing water and calcined gypsum using a 'hollow connector section' 45 to facilitate feeding the gypsum slurry mixed by the mixer to the 'chute section 41'." Fractionation of the slurry is not disclosed in Miura *et al.*

iv) Patentability of the present invention over the cited prior art

The original specification provides the following explanation of the invention, at page 6, lines 2-10 and page 7, lines 11-23 (corresponding to paragraphs 00016 and 00021 of the substitute specification):

As a result of the present inventors' research of accomplishing the aforementioned objects, the present inventors noted that the density and pressure of the gypsum slurry can be most stable in a hollow connector section and a chute section which extract the slurry from the mixer to discharge it to the center part of a gypsum board liner paper. The inventors found out that fractionation of slurry in these sections allows the slurry to be continuously fractionated in a stable condition in regard to the density and flow rate of the slurry, and enables centralized control of the density and flow rate of the slurry.....

* * * *

According to the present invention, the gypsum slurry after preparation is fractionated from the chute section and/or the hollow connector section which are stable in the density and pressure of the slurry, and therefore, a standard deviation of the density of the fractionated slurry, i.e., scattering of the slurry density, is considerably reduced in comparison with that of the fractionated slurry conventionally fractionated from the peripheral outer wall of the mixer. Further, the flow rate of the slurry delivery conduit is stable since the chute section and the hollow connector section have relatively high slurry pressures. Stability of the density and flow rate of the fractionated slurry allows control of the density and flow rate of the slurry to be facilitated. Therefore, addition of the foam or foaming agent can be effectively performed so that the consumption rate of the foam or foaming agent is reduced.

The inventors of the present invention recognized the stable density of the slurry and stable high pressure of the slurry in a hollow connector section and a chute section. None of the cited references discloses or suggests that such a condition or state can be obtained in the hollow connector and the chute sections. None of the cited references discloses or suggests that a part of the gypsum slurry therein can be delivered through the slurry fractionation port to the slurry delivery conduit by the fluid pressure in the chute or hollow connector section, in spite of the fact

that the fluid pressure therein merely derives from the displacement or delivery pressure of the mixer.

Particularly, in the arrangements disclosed in US 5,714,032 (Ainsley *et al.*) and WO 93/03899 (Bold), the slurry is fractionated by the suction pressure of the pump. However, it is difficult to apply such an arrangement to the production of the gypsum slurry in practice, owing to jamming or clogging of the pump. Even if it is assumed that such an arrangement is applicable to the production of gypsum slurry, the suction pressure of the pump adversely affects the main flow of slurry to be directed to the lower sheet.

The inventors of the present invention further recognized the possibility of centralized control of the density and flow rate of the slurry (that is, operation in a condition that the fractionated slurry has the same mixed condition and components as those of the main slurry discharged onto the lower sheet). This concept is not taught or suggested by JP 08-112808, US 5,683,635 (Sucech *et al.*), US 6,878,321 (Hauber *et al.*), and US 6,190,476 (Seecharan *et al.*), in which the main slurry and fractionated slurry are flowing out of the mixing area from different circumferential points or positions of the mixer housing (peripheral outer wall).

As described in the original specification at page 7, lines 14-23 (corresponding to paragraph 00021 of the substitute specification):

> [A] standard deviation of the density of the fractionated slurry, i.e., scattering of the slurry density, is considerably reduced in comparison with that of the fractionated slurry conventionally fractionated from a peripheral outer wall of the mixer... Stability of the density and flow rate of the fractionated slurry allows control of the density and flow rate of the slurry to be facilitated. Therefore, addition of the foam or foaming agent can be effectively performed so that the consumption rate of the foam or foaming agent is reduced.

These effects or advantages are explained in detail with reference to Figure 10, a copy of which is provided as Attachment 2 to this Response. The differences in effects or advantages between the present invention and the differences in effects or advantages between the present invention and the conventional arrangement (JP 08-112808) are shown in Attachment 2 and described in the original specification at page 27, line 6 - page 28, line 4 (corresponding to paragraphs 00018 - 00021 of the substitute specification).

As shown in "Density of Slurry" in Attachment 2, the standard deviations in the edge parts and the center part can be reduced in accordance with the present invention. That is, the density of the slurry fractionated from the mixer can be substantially stabilized according to the present invention.

As shown in "Rate of Change in Volume" in Attachment 2, change of the slurry flow rate can be reduced in accordance with the present invention. That is, the flow rate of gypsum slurry can be stabilized according to the present invention.

As shown in Attachment 2, the product (gypsum board) produced in accordance with the present invention exhibits excellent performances with respect to the adhesiveness of the right face, the standard deviation of the surface hardness, the average value of the core hardness, and the standard deviation of the core hardness.

As shown in "Reduction of Consumption Rate" in Attachment 2, the consumption rate of the foaming agent and that of adhesive auxiliary agent can be significantly reduced, in accordance with the present invention.

Therefore, the present invention makes it "possible to surely control the density of the gypsum slurry to be fractionated from the mixer, restrict the change in the flow rate of the fractionated flurry, and reduce the consumption of foam or foaming agent," as described in the

original specification at page 29, lines 15-18 (corresponding to paragraph 00015.1 of the substitute specification).

In view of the foregoing, it is respectfully submitted that the invention as recited in claim 19, and the claims depending therefrom, is patentable over the cited prior art; and that the rejection should be withdrawn.

Conclusion

All objections and rejections have been complied with, properly traversed, or rendered moot. Thus, it now appears that the application is in condition for allowance. Should any questions arise, the Examiner is invited to call the undersigned representative so that this case may receive an early Notice of Allowance.

Favorable consideration and allowance are earnestly solicited.

Respectfully submitted,

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Date: September 12, 2008

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Enclosures: Substitute Specification (clean and marked-up)
Attachments 1 and 2